

**FINAL WORK PLAN
FOR
METHANE MONITORING AT SITE 1 – OLD BASE LANDFILL
FORMER NAVAL TRAINING CENTER BAINBRIDGE
PORT DEPOSIT, MARYLAND**

**CONTRACT NUMBER: N40080-12-D-0451
TASK ORDER 0007**

Prepared For:



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By their signature, the following individuals certify their review and approval of this *Final Work Plan for Methane Monitoring at Site 1 – Old Base Landfill, Former Naval Training Center - Bainbridge, Port Deposit, Maryland.*

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LIST OF ACRONYMS

APEX	APEX Companies, LLC
APP	Accident Prevention Plan
BDC	Bainbridge Development Corporation
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CH ₄	Methane
CO ₂	Carbon dioxide
COMAR	Code of Maryland Regulations
GP	Gas probe
H&S	H&S Environmental, Inc.
IR	Installation Restoration
IRM	Interim Remedial Measure
LEL	Lower Explosive Limit
MDE	Maryland Department of the Environment
NAVFAC	Naval Facilities Engineering Command
Navy	U.S. Navy
NTCB	Naval Training Center Bainbridge
O ₂	Oxygen
OBL	Old Base Landfill
PID	Photoionization detector
SOW	Statement of Work
SSHP	Site Specific Safety and Health Plan
USACE	U.S. Army Corps of Engineers
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

This Work Plan was prepared to describe the planned methane monitoring events to be conducted at Site 1 – Old Base Landfill (OBL) at the former Naval Training Center Bainbridge (NTCB) in Port Deposit, Maryland.

H&S Environmental, Inc. (H&S) has prepared this Work Plan for the Naval Facilities Engineering Command (NAVFAC) Washington under Contract N40080-12-D-0451, Task Order 0007.

1.1 Project Objectives

The objective of this Work Plan is to describe the planned field and reporting activities that will be implemented to complete methane monitoring at Site 1 - OBL. Site 1 will be monitored on a monthly basis for a period of one (1) year.

The following sections of this Work Plan provide the site description and background as well as procedures and methodologies required to complete methane monitoring at the above site.

1.2 Site 1 – Old Base Landfill Background

The former NTCB is situated on approximately 1,185 acres in Cecil County, Maryland to the northeast of the town of Port Deposit (**Figure 1**). NTCB was constructed in 1942 as a training center for World War II Navy recruits and in the post-war years, became the host for various schools and functions (U.S. Navy [Navy], 2000). NTCB was formally closed in 1976 and transferred from the Navy to the Bainbridge Development Corporation (BDC) in 2000 (U.S. Army Corps of Engineers [USACE], 2007).

The OBL site is located on approximately 15 acres in the northwestern boundary of the former NTCB, separated from Maryland Route 276 by a facility fence and a small, unnamed stream (USACE, 2007). The OBL was a solid waste landfill that operated from 1942 until base closure in 1976. Disposal activities were unregulated and the landfill is unlined. In 1995, the landfill was capped as an Interim Remedial Measure (IRM). Repairs and extensions to the cap were made in 1999 (Navy, 2000). Additional repairs were made to gas vents by the Navy in 2007 to 2008.

Presently, the existing cover system at OBL includes 33 gas vents on the landfill cap and 26 gas probes surrounding the landfill perimeter (AGVIQ, 2014). Based on methane monitoring data collected during the period from 2007-2014 from gas probes along the perimeter of OBL, high concentrations of methane (exceeding 100 percent of the lower explosive limit [LEL]) have been observed in gas probes GP-6, GP-7, GP-8, and GP-12 (**Figure 2**).

1.3 Site 1 – Old Base Landfill Methane History

As detailed in the *Methane Monitoring Plan, Old Base Landfill (OBL), Former NTCB, Port Deposit, Maryland* (APEX, 2010), a Final Landfill Investigation Report dated May 2007 for Installation Restoration (IR) Site 1-OBL was prepared by USACE on behalf of the Navy at the request of the Maryland Department of the Environment (MDE). The work was completed on May 10, 2006, and consisted of field screening of 33 existing OBL gas vents to determine the distribution and concentration of explosive gases being vented. Ten gas probes (GP- 1 through GP-10) located along the perimeter of the OBL were also monitored to evaluate methane (CH₄) migration.

During the landfill investigation, the 33 landfill passive gas vents were screened for CH₄, carbon dioxide (CO₂), oxygen (O₂) and percent LEL of CH₄ using a landfill gas analyzer and were also screened for volatile organic compounds (VOCs) with a photoionization detector (PID). Screening results of the passive gas vents identified that the vents located along an east-west trend were venting significant concentrations of methane, which was noted as evidence that the vent system was functioning as designed. At the time, the highest concentrations were reported in the center of the landfill (gas vent G-24 at 538 percent LEL for methane).

Ten gas probes (GP-1 through GP-10) located along the perimeter of the OBL were also monitored. The probes along the north, east, and south indicated that landfill gas was not migrating in these directions. However, several gas probes located along the western perimeter of the Site 1-OBL exhibited methane concentration exceeding the 100 percent LEL. The report concluded that while methane concentrations were over 100 percent of the LEL in gas probes located along the western perimeter of the landfill cap, they were lower in a westward direction toward the property boundary, as confirmed during a methane soil gas survey in 2005. According to the report, it was believed that the Western Channel acted as a discharge location to vent methane and other gases due to its lower elevation relative to the landfill and the gravel and stone that line the channel. Since no facility structures existed on the western side of the landfill, the report concluded that the 25 percent LEL criteria did not apply. Therefore, based on these sampling results, the report concluded that methane concentrations were within the acceptable range indicating that the property presently appears to be in compliance with COMAR 26.04.07.03B(9).

A Final Closeout Report for OBL was prepared by Shaw in January 2008 on behalf of the Navy. According to the report, five additional methane monitoring probes (GP-11 through GP-15) were installed near the property boundary along Maryland Route 276. These methane monitoring probes were installed along the western portion of the landfill to monitor methane west of the Western Channel. APEX has been performing methane monitoring at the landfill from December 2007 to September 2011 on a semi-annual basis and then quarterly through the present time. Methane monitoring data from 15 methane monitoring probes between 2007 and 2014 indicate that high concentrations of methane (exceeding 100 percent LEL) have been observed in gas probes GP-6, GP-7, GP-8, and GP-12 (AGVIQ, 2014).

1.4 Plan Organization

The work plan consists of the following sections:

- Section 1.0 - Introduction: This section presents the objectives of the Work Plan, site description and background.
- Section 2.0 - Methane Monitoring and Reporting: This section details the procedures that will be followed to perform landfill gas monitoring and reporting to be conducted under the Work Plan.
- Section 3.0 – Schedule: This section provides the planned monitoring and reporting schedule.
- Section 4.0 - References

2.0 METHANE MONITORING AND REPORTING

The scope of work includes completing methane monitoring and reporting at 26 locations (GP-1 through GP-26) at the Site 1 – OBL on a monthly basis for a period of one (1) year. **Figure 2** illustrates locations to be monitored.

This Work Plan describes the procedures and methodology to be utilized in the field to complete the task described above. The methane monitoring activities that will be conducted at Site 1 will include the following tasks, which are discussed in greater detail below:

- Mobilization/demobilization,
- Instrument calibration and maintenance
- Sampling
- Field documentation
- Reporting
- Health and Safety

2.1 Mobilization/Demobilization

All field team members will review this Work Plan and the project Accident Prevention Plan and associated Site Specific Safety and Health Plan (SSHP) prior to the initiation of field activities. In addition, a field team orientation meeting will be held to familiarize personnel with the scope of the field activities. Activity hazard analyses (AHAs) for each feature of work are contained in the APP and will be reviewed prior to initiating work.

2.2 Instrument Calibration and Maintenance

The Landtec GEM 2000™ landfill gas analyzer will be calibrated prior to the start of field activities every day. The calibrations will be documented along with all other field notes taken at the site. The Landtec GEM 2000™ meter utilizes a self-compensating infrared gas analyzer and an internal sample pump capable of drawing a gas sample in to the unit for analysis. The meter will be field checked prior to use at each sample location to ensure proper function.

2.3 Landfill Gas Sampling

Temperature, barometric pressure, humidity and general weather conditions will be noted upon arrival at each sample location.

The landfill gas analyzer will then be turned on, or put into active mode (from stand-by mode), and the sample tubing will be securely connected to the hose barb on the passive vent sample port. The sample port valve will be opened to allow landfill gas to be drawn into the instrument. Continuous readings will be collected over a 3-5 minute duration until readings stabilize. The final steady state readings will be recorded as indicated below. Following monitoring activities, the sample port valve will be closed and the protective cover will be secured before moving on to the next monitoring location.

The following will be recorded on the field logsheet included as **Appendix A**:

- %CH₄
- %O₂
- %CO₂
- %LEL CH₄
- % Balance

Methane monitoring locations are shown for Site 1 - OBL on **Figure 2**.

2.4 Field Documentation

Sample documentation will consist of the completion of logsheets (**Appendix A**) and recording daily activities in a Site Logbook dedicated to this work, which serves as the overall record of field activities. Information included daily in the Site Logbook includes weather conditions, identity and arrival and departure times of personnel, management issues, etc.

2.5 Reporting

Within two weeks following completion of the field activities, the monitoring results will be submitted electronically to stakeholders as specified in the project Statement of Work (SOW).

2.6 Health and Safety

Proper procedures will be followed and each site worker will be required to adhere to APP (H&S, 2014).

3.0 SCHEDULE

Methane monitoring will be performed on a monthly basis for a period of one (1) year. The project will commence following Work Plan concurrence in January 2015. The project implementation schedule will be updated throughout the course of the project as needed. If the proposed dates for completion of site work or reporting are delayed, the client shall be notified of the change and the rationale for the change.

4.0 REFERENCES

AGVIQ, LLC (AGVIQ), 2014. *Draft Final Technical Memorandum – Gas Probe Installation and Monitoring Data Report, Site 1 Old Base Landfill (OBL)*. Former Naval Training Center – Bainbridge, Port Deposit, Maryland. June.

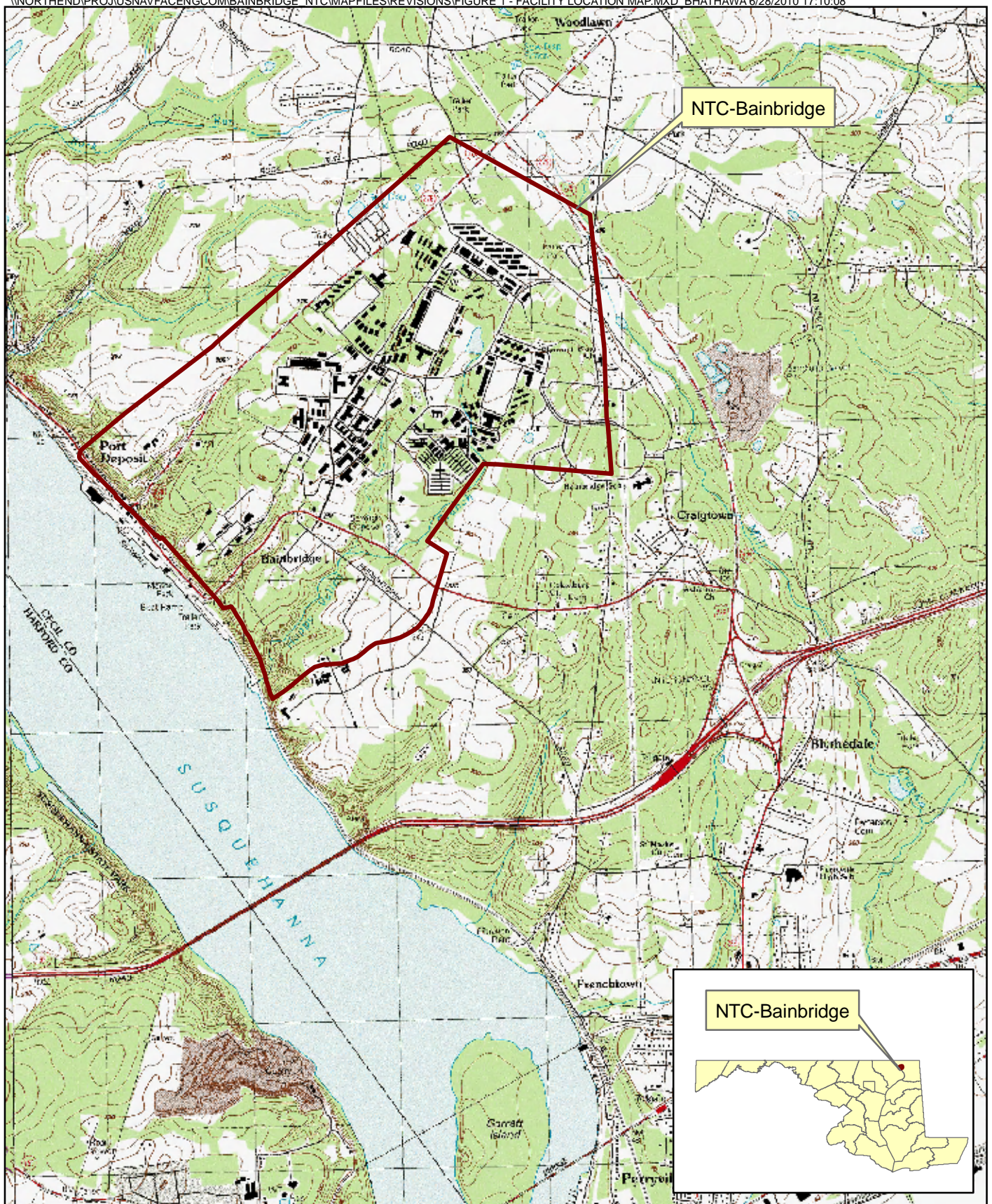
Apex Companies, LLC (APEX), 2010. *Methane Monitoring Plan – Old Base Landfill (OBL)*. Former Naval Training Center – Bainbridge, Port Deposit, Maryland. December.

H&S, 2014. *Accident Prevention Plan – CERCLA Five Year Review – Old Base Landfill and Fire Training Area and Old Base Landfill Methane Monitoring*. Former Naval Training Center - Bainbridge, Port Deposit, Maryland. October.

U.S. Army Corps of Engineers (USACE), 2007. *Landfill Investigation Report for IR Site 1(Old Base Landfill)*, Former Naval Training Center - Bainbridge, Port Deposit, Maryland. Final. May.

U.S. Department of the Navy (Navy), 2000. *Finding of Suitability to Transfer*, Naval Training Center - Bainbridge, Port Deposit, Maryland. February.

FIGURES



Legend

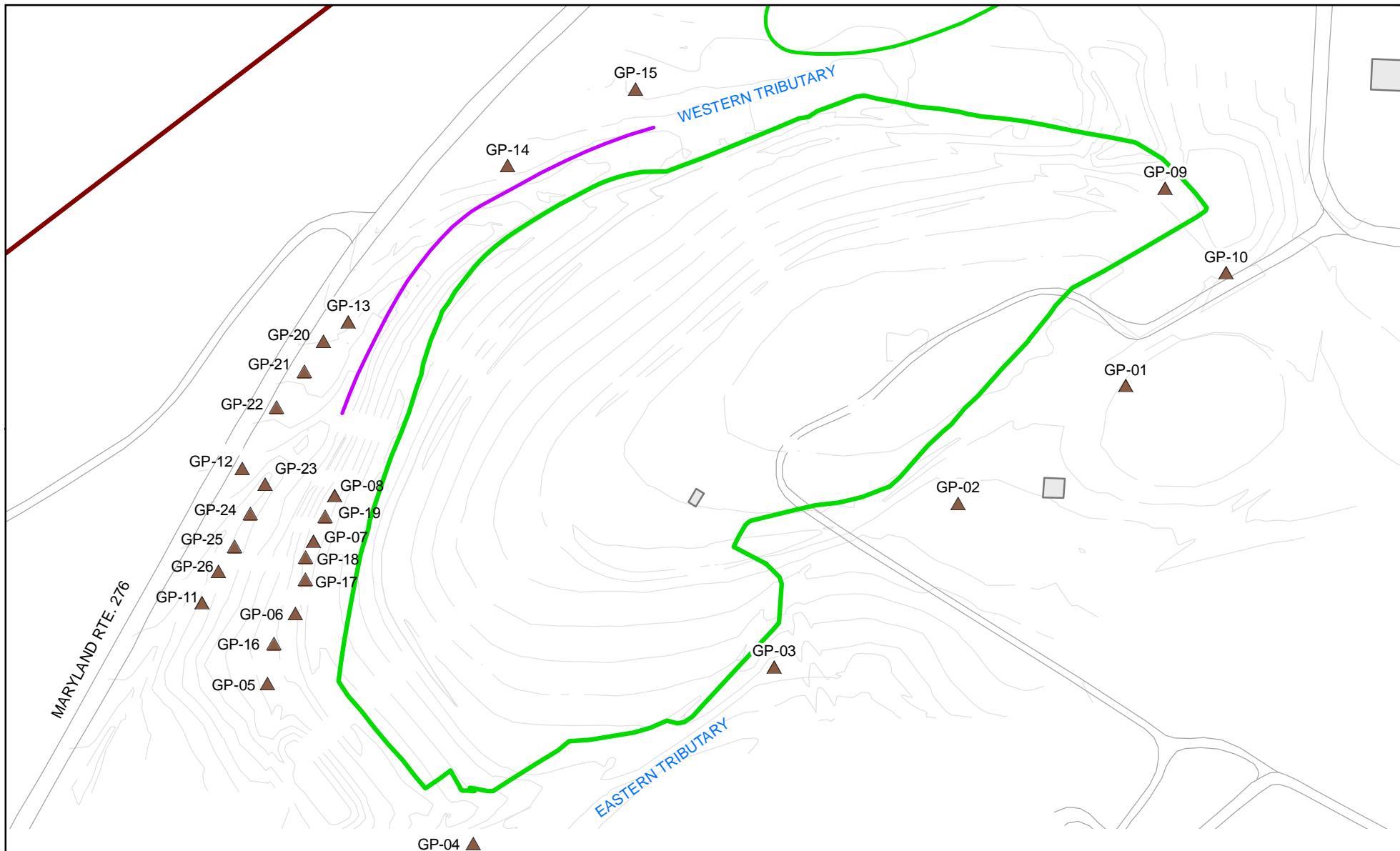
Installation Area



0 1,500 3,000
Feet

Figure 1
Facility Location Map
Former Naval Training Center: Bainbridge
Port Deposit, Maryland





Legend

▲ Gas Probe Location

○ Culvert Inlet

○ Culvert Outlet

⊕ Drain

■ Outfall

— Elevation Contour Line (5 ft Interval)

— Rip-Rap Channel

□ Existing Structure

□ Installation Area

■ Landfill Area

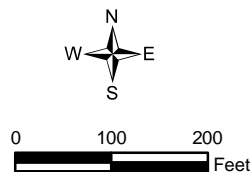


Figure 2
Methane Monitoring Locations
Former Naval Training Center: Bainbridge
Port Deposit, Maryland



APPENDIX A
METHANE MONITORING LOGSHEET

Methane Monitoring Logsheet

Site 1 - Old Base Landfill Former NTC Bainbridge, Port Deposit, Maryland

Date:

Personnel:

Start Time:

Weather:

Barometric Pressure (inches Hg):

Relative Humidity (%)

Finish Time:

Instrument: LandTec GEM-2000

Serial Number:

Calibrated (Y/N):

Sampling Location	Measurement at Indicated Gas Probe					Notes / Observations
	CH ₄ %	CO ₂ %	O ₂ %	Balance %	LEL % CH ₄	
GP-1						
GP-2						
GP-3						
GP-4						
GP-5						
GP-6						
GP-7						
GP-8						
GP-9						
GP-10						
GP-11						
GP-12						
GP-13						
GP-14						
GP-15						
GP-16						
GP-17						
GP-18						
GP-19						
GP-20						
GP-21						
GP-22						
GP-23						
GP-24						
GP-25						
GP-26						

NOTES:

GP - Gas probe location